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SAND CLOCK.

Fig. 1.

Fig. 2.

Description.

ABC is a hollow tube, of either wood or metal, and filled with very dry sand; a small aperture at C permits the sand to escape into the basin, D. On the top of the sand in the tube is placed a weight, W (fig. 2) to which a string is tied, with a billet, *p*, at the other end, and which is passed over the axis, on which the pointer or index is fixed. A small cone on the axis, in which is a number of grooves for the string to pass over, serves to regulate the string, and when once properly adjusted, will go with great accuracy. E is a lamp or candle placed on a bracket, to show what o'clock it is in the night, in a sick-room or nursery, where a light is burned. F. is a hook to hang it up by, either against a wall or on a chair back.

A HINT TO PUBLISHERS.

SIR,—In the course of reading foreign works I have found considerable convenience in the mode almost universally adopted abroad, of attaching maps and plans by blank leaves, so that the edges of the maps and plans may be clear of the leaves and cover, whether the book be open or shut. This mode is rarely followed in this country; but, with all respect for the judgment of publishers, I venture to give my humble opinion that readers in general would be very considerably convenienced by the adoption of such trifling alteration.—You, sir, must have often observed that this mode gives the reader the full use of every part of a map or plan, without the continual occasion for lifting the leaves, and even without opening the volume.

Lond. Mec. Mag.

STANDARD FOR LINEAL MEASURE.

SIR,—In the MECHANICS' MAGAZINE there is a very good paper, by Mr. Pasley, on the importance of obtaining a natural Standard of Lineal Measure, which is certainly well calculated to answer the end designed by its authors. But the method which he suggests for that purpose cannot be new. I think it must have been tried, and was not found to be so correct in practice as the one by the pendulum; for we cannot suppose that our scientific men have made so many experiments with the pendulum, and have not tried this method, when they can very easily obtain, by mathematical calculations, the space that a heavy body would fall through by the force of gravity, in vacuo, in a given time—a second, for instance—by knowing the length of a pendulum vibrating soconds, at the same place, *et vice versa*. I say at the same place, because the force of gravity varies with the latitude; and a standard obtained by either of the above methods at London would not be of the same length with one obtained by a pendulum making the same number of vibrations, or by the space that a heavy body would fall through in the same time at the Poles as the force of gravity continually increases from the Equator to the Poles, where, I suppose, it is a maximum. Hence we see that a standard obtained by the above methods is not universal but confined to a certain place, and that the variations of a degree in latitude would not make much difference.

The French academicians obtained their standard by mearsuring the meridian, and taking for that purpose the forty-millionth part of it, which they call a *metre*, from which all the measures and weights of the French nation are deduced. This quite contradicts the assertion that "Motion alone presents the only means of obtaining a lineal standard which is founded in nature." Perhaps the following results of computations and experiments* may be useful to some of your numerous readers:—

The pendulum vibrating seconds of mean solar time at London, in a vacuum, and reduced to the level of the sea, is 39.1393 inches; *consequently the descent of a heavy body, from within one second of time, in a vacuum, will be* 193.145 *inches.*

A platina metre, at the temperature of 32 degrees, supposed to be the ten-millionth part of the quadrant of the meridian, 39 3708 inches, the ratio to the imperial measure of three feet, as 1.09363 to 1.

The five following standards, accurately measured, give these results: Gneral Lambton's scale, used in the Trig. Surv. of India, 35 99934 inches. Sir G. Shuckburgh's scale (which, for all purposes, may be considered as identical with the imperial standard,) 35.99998 inches. Gen. Roy's scale, 36.00088 inches. Roy Soc. Standard, 36.00135. In Ramsden's bar., 36.00249 inches.

Weight of a cubic inch of distilled water in a vacuum, at the temperature of 6: 8, is opposed to brass weights in a vacuum also, 252 722 grains: consequently a cubic foot 62.3862 pounds avoirdupois. Weight of a cubic inch

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* Extracted from the Imperial Almanac.

of distilled water in air, at 62° of temperature, with a mean height of the barometer, 252.456 grains; consequently a cubic foot 62.3206 pounds avoirdupois; and an ounce of water, 1.73298 cubic inches. Cubic inches in the imperial gallon, 277.276. Diameter of the cylinder containing a gallon, at one inch high, 18.78933.—Specific gravity of water at different temperatures, that at 62° being taken as unity:—

70°	0.99913	64°	0.99980	56°	1.00050	50°	1.00087	44°	1.00107
68	0.99936	62	1	54	1.00064	48	1.00095	42	1.00111
66	0.99958	58	1.00035	52	1.00076	46	1.00102	40	1.00113
								38	1.00113

The difference of temperature between 62 degrees and 39 degrees, when water attains its greatest density will vary the bulk of a gallon of water rather less than the third of a cubic inch; and assuming, from the mean of numerous estimates, the expansion of brass 0.00001044, for each degree of Fahrenheit's thermometer, the difference of temperature, from 62 degrees to 39 degrees, will vary the contents of a brass gallon measure just one-fifth of a cubic inch. It appears that the specific gravity of clear water from the Thames exceeds that of distilled water, at the mean temperature, in the proportion of 1.0006 to 1, making a difference of about one-sixth of a cubic inch on a gallon. Rain water does not differ from distilled water, so as to require any allowance for common purposes.

By inserting the above in your useful Magazine, you will much oblige,

Sir, your obedient servant,

W. LAKE.

Lond. Mech. Mag.

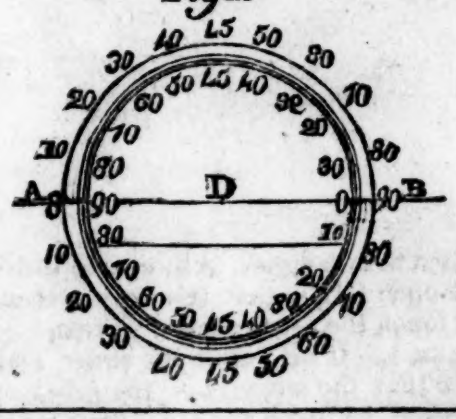
ON A MODIFICATION OF DR. BREWSTER'S PROTRACTOR.

SIR,—It was not till a very short time ago, that I was aware of Dr. Brewster's having noticed the circular, instead of the semicircular instrument, for measuring and laying down angles. I had previously believed that the thought, simple as it was, *originated* with myself; though, it must be confessed, that my being almost in the daily habit of using Leslie's Geometry, in which a similar instrument is mentioned (p. 321, 4th ed.) seems very likely to have been my real authority. However, be that as it may, the more important consideration to the public is the utility of this, in preference to other protractors, and the best and most facile method of using it. I think the following method will be found in some respects preferable to Dr. Brewster's;* and as I have never seen it brought into use, nor even described in any work which is at all likely to come before the greater portion of your readers, you will, I think, be doing some service by publishing an account of it.

Description of the Instrument.

The first figure represents the instrument. ADB is the diameter, and D the centre of the ring. The rim is divided into two concentric circles, for the purpose of containing the numbers of its graduations, which run in a reverse order to each other. The inner ring has its graduations numbered from B *upwards* and *downwards*, and the outer ring from A also *upwards* and *downwards*. The whole circumference being divided into 180 degrees instead of 360 degrees, we shall have 90 degrees at A on the inner ring, and 90 degrees at B on the outer ring, and 45 degrees upon both rings, where a diameter perpendicular to AB cuts them. In our diagram we have only numbered every ten degrees, and marked every five. This will suffice to show the principle, and to render the application of the instrument intelligent to every one.

Fig 1.



* Treatise on New Philosophical Instruments, 8vo. Edin. 1813.

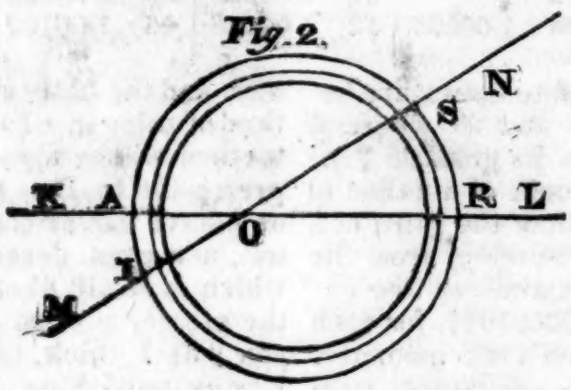
USE.

PROBLEM I.

To measure a given angle.

CASE 1.—When the lines actually meet, as KL, MN, fig. 2, place the diameter of the instrument so that it shall coincide with either of the lines (in our illustrations we shall take the side which *dips towards the right* in the diagram,) as KL; add the numbers comprised between BS on the inner ring, and between AT on the outer ring; the sum will give the magnitude of the angle.

Fig. 2.



NOTE 1.—This method applies to the case where the lines KL, MN form so small an angle, that this point of intersection cannot be determined with any degree of certainty. This is one of the greatest advantages possessed by this over the common protractor.

NOTE 2.—When the point, O, can be accurately determined, the trouble of adding may be avoided, by putting the point, A, of the instrument, upon the point, O, of the diagram; BS, on the inner ring, will then give the magnitude of the angle.

NOTE 3.—When, however, the angle approaches to a right angle, the method of taking the sum of the two arcs, AT, and BS, is to be preferred.

CASE 2.—When the lines, KL, MN, do not meet, as in fig. 3.

Place the diameter upon KL, as before. Take the *difference* between the arcs AT, BS; the former measured upon the outer, the latter upon the inner scale.

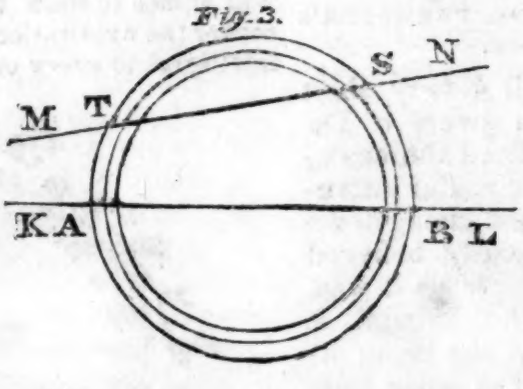
Note.— This mode of taking the measure of the angle will be highly useful in most of the arts where accurate drawing is of essential consequence.

PROBLEM II.

Through a given point to draw a line which shall make a given angle with a given line.

Let S, figs. 2 and 3, be the given point, and KL the given line.

Fig. 3.



Place the diameter, AB, of the instrument upon KL, so that the circumference shall touch the given points. Then,

CASE 1.—If SB, upon the *inner* scale, be *less* than the measure of the given angle, count AY upon the outer scale, equal to the *deficiency*, and mark the point, T' upon your paper. The line, ST, being drawn, will be that required (fig. 2.)

CASE 2.—If SB, upon the outer ring, be *greater* than the given angle, mark its

excess, AT, upon the outer (fig 3;) the ST, as before, will be the direction of the required line.

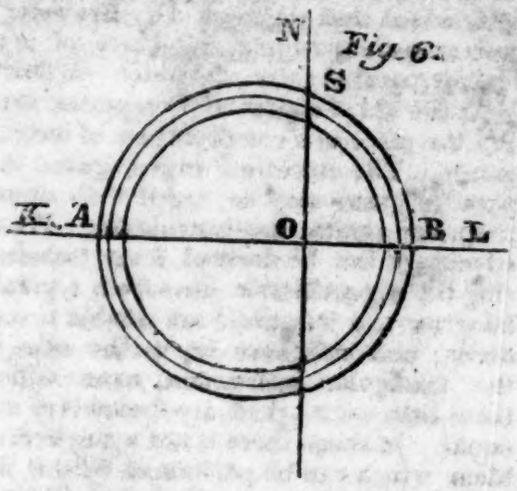


Fig. 6.

NOTE 1.—When the required angle is right, or we are required to raise a perpendicular to a given line, which shall pass through a given point, the instrument is very useful. For, fig. 6, we have only to make BT equal to BS, and ST is the perpendicular required. The intelligent artisan will see that this is only a modification of our last case.

NOTE 2.—If the point through which the perpendicular is to pass is *in* the given line, the same method which is adapted to the common or semicircular protractor applies. Bring the centre, D, (fig. 7) to the given point, and the perpendicular will pass through the point marked 45 upon the scale.

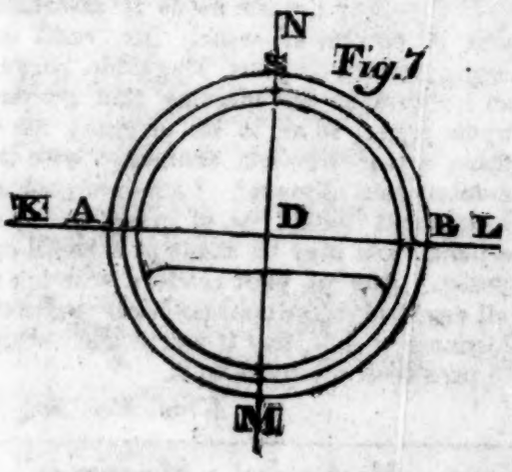


Fig. 7

NOTE 3.—To draw a parallel to a given line, which shall pass through a given point, is a problem effected with the same case. It is, in fact, identical with the solution of the same problem by the common protractor, and the method will be obvious from an inspeciion of fig. 4, where KL is the given line, and S or T the given point.

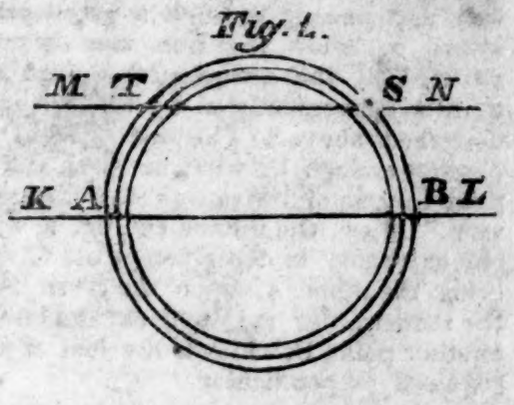


Fig. 4.

CASE 2.—If the point through which the perpendicular is to pass be situated beyond the reach of the instrument, when its diameter coincides with the line KL, this method may be adopted.

Place one end, B (fig. 5,) of the diameter in the given point, and bring the other end, A, to cut in the given line: take the arc BT equal to the arc AS, cut off by KL; then BT being drawn will be parallel to KL.

CASE 3.—If the given point be *in* the given line, we have merely to place the point, A of the instrument upon the given point, and note the point where the degree required of the instrument touches the paper; the line drawn from A through that point is the one required. This is too obvious to need a diagram.

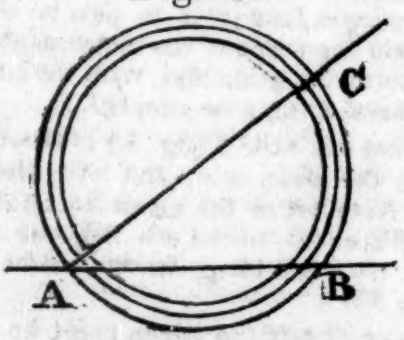
Fig. 5.

Having thus shown the construction and use of the instrument, it may not be unappropriate to make a few remarks upon the different forms which are given to instruments for the same purpose.

The first in order of comparison is the common semicircle. Its chief advantages over that instrument are in its adaptation to cases where the lines are nearly paral-

lel, or the angle of inclination very small, and where the lines do not meet within a conveniently accessible distance. The case of drawing a perpendicular to a given line, and passing through a given point above or below that line, may be constructed by the *semicircular*, though not quite so conveniently as by that we have described above. The method will be obvious enough by what has been said in your Course of "MECHANICAL GEOMETRY." Lay the instrument, fig. 8, with one extremity in the given point, C, and bring the other, A, upon the given line; the semicircular ring will cut the line in another point, B, which is the foot of the required perpendicular.

Fig. 8.



Another advantage worthy of remark, is, that this instrument is far more portable than the semicircle; for the graduations are of the same dimensions upon this instrument, of *three inches* diameter, as they are upon a semicircle of *six inches* diameter; it is, therefore, better fitted for a common case of instruments.

The next comparison is with the protractor laid down upon the parallelogram, generally at the back of the plain scale.—The neatness of its appearance seems to have been the principal incentive to the adoption of this form. The greater magnitude of the divisions *near the ends*, if it were not more than compensated by the *less magnitude* of those near the middle, would certainly be so by the difficulty of *marking an oblique line* from that scale and of avoiding the *variation* in the system of errors arising from that source. Nor can any certain *estimate* be made by this instrument of the halves or thirds of a division—a defect from which the circular instruments are also free.

The last comparison we shall at present make will be with Jordan's Panmetron—not, indeed that we think Dr. Brewster's instrument can supply the place of protractor, parallel ruler, and sector—in short, with the aid of a pair of compasses, supply the place of a complete case of instruments. The objections urged against the parallelogram may be urged with equal propriety against this instrument. What advantage can be derived from transferring the trigonometric lines from a parallelogram to a triangle, I am unable to discover; and still more so, as the sides of the triangular instrument, upon which these lines are marked, are themselves unequal. In short, there is not a single problem which can be performed by this instrument which cannot be performed by a common Gunter; if, indeed, we except that of drawing parallel lines, which, however, is not new, being known long since in our military schools, and most surveyors' offices. The method, indeed, is but an application of Marquoi's parallel scales to the simplest purpose for which they were *originally intended*. The great advantage, too, of the sector (*its invariable reading*) is entirely overlooked in the Panmentron.

What peculiar excellence the patrons of this contrivance saw in it, I must confess my inability to discover; but any of your readers who can supply my "lack of wit," will confer a favour upon me by entering fairly into the discussion.

T. S. D.

P. S.—May not the mode of describing arcs of circles, of which the *radii are large*, noticed in your Magazine, suggest an inrtrument for effecting that purpose upon paper, so as to be of great use to those artists who are connected with the construction of maps? I am sure such an instrument would be of great utility in schools, and may be made at a small expense. Any of your readers who are at all engaged in the mathematical instrment business, would find it worth their while to turn their attention to it.

Lond. Mec. Mag.

Communications for the American Mechanics' Magazine, Post paid, and addressed to

JAMES V. SEAMAN,

Broadway, New-York, will receive due attention.

William Van Norden, Printer.

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